would also cover, for example and if applicable to the particular element, a baseband integrated circuit or applications processor integrated circuit for a mobile phone or a similar integrated circuit in a server, a cellular network device, or another network device.

[0057]   The techniques and methods described herein may be implemented by various means. For example, these techniques may be implemented in hardware (one or more devices), firmware (one or more devices), software (one or more modules), or combinations thereof. For a hardware implementation, the apparatus(es) of embodiments may be implemented within one or more application-specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FP-GAs), processors, controllers, micro-controllers, microprocessors, other electronic units designed to perform the functions described herein, or a combination thereof. For firmware or software, the implementation can be carried out through modules of at least one chip set (e.g. procedures, functions, and so on) that perform the functions described herein. The software codes may be stored in a memory unit and executed by processors. The memory unit may be implemented within the processor or externally to the processor. In the latter case, it can be communicatively coupled to the processor via various means, as is known in the art. Additionally, the components of the systems described herein may be rearranged and/or complemented by additional components in order to facilitate the achievements of the various aspects, etc., described with regard thereto, and they are not limited to the precise configurations set forth in the given figures, as will be appreciated by one skilled in the art.

[0058]   Thus, according to an embodiment, the apparatus comprises processing means configured to carry out embodiments of any of the FIGS. 1 to 7. In an embodiment, the at least one processor 502, the memory 504, and the computer program code form an embodiment of processing means for carrying out the embodiments of the invention. In another embodiment, the at least one processor 602, the memory 604, and the computer program code form an embodiment of processing means for carrying out the embodiments of the invention.

[0059]   Embodiments as described may also be carried out in the form of a computer process defined by a computer program. The computer program may be in source code form, object code form, or in some intermediate form, and it may be stored in some sort of carrier, which may be any entity or device capable of carrying the program. For example, the computer program may be stored on a computer program distribution medium readable by a computer or a processor. The computer program medium may be, for example but not limited to, a record medium, computer memory, read-only memory, electrical carrier signal, telecommunications signal, and software distribution package, for example.

[0060]   Even though the invention has been described above with reference to an example according to the accompanying drawings, it is clear that the invention is not restricted thereto but can be modified in several ways within the scope of the appended claims. Therefore, all words and expressions should be interpreted broadly and they are intended to illustrate, not to restrict, the embodiment. It will be obvious to a person skilled in the art that, as technology advances, the inventive concept can be implemented in various ways. Further, it is clear to a person skilled in the art that the described

embodiments may, but are not required to, be combined with other embodiments in various ways.

1-36. (canceled)

37. A method, comprising:

obtaining, at a base station of a secondary user system utilizing shared radio communication resources with a coexisting primary user system, channel state information with respect to both a propagation channel between at least one secondary user and the base station and a propagation channel between the at least one secondary user and at least one primary user;

jointly determining power allocation and transmit coefficients for at least one data stream which is to be transmitted from the at least one secondary user to the base station, wherein the joint determination comprises maximizing a function related to a transmit covariance of at least one secondary user and to at least part of the obtained channel state information, wherein the maximized function is subject to at least one of the following constraints: power allocation across one or more of the at least one secondary user does not exceed a predetermined power threshold, and interference to the at least one primary user does not exceed a predetermined interference threshold; and the method further comprises:

causing communication of information indicating the determined power allocation and transmit coefficients to the at least one secondary user in order to allow the at least one secondary user to apply the determined power allocation and transmit coefficients in data communication.

38. A method, comprising:

determining, at a user terminal of a secondary user system utilizing shared radio communication resources with a coexisting primary user system, channel state information with respect to a propagation channel between the secondary user and each of at least one primary user;

cause communication of information indicating the determined channel state information to a base station of the secondary user system; and

acquiring information indicating power allocation and transmit coefficients from the base station in order to apply the power allocation and transmit coefficients in data communication.

39. An apparatus, comprising:

at least one processor and at least one memory including a computer program code, wherein the at least one memory and the computer program code are configured to, with the at least one processor, cause the apparatus at least to:

obtain channel state information with respect to both a propagation channel between at least one secondary user and a base station and a propagation channel between the at least one secondary user and at least one primary user, wherein the base station is a base station of a secondary user system utilizing shared radio communication resources with a coexisting primary user system;

jointly determine, in the base station, power allocation and transmit coefficients for at least one data stream which is to be transmitted from the at least one secondary user to the base station, wherein the joint determination comprises maximizing a function related to a transmit covariance of at least one secondary user and to at least part of the obtained channel state information, wherein the maximized function is subject to at least one of the